

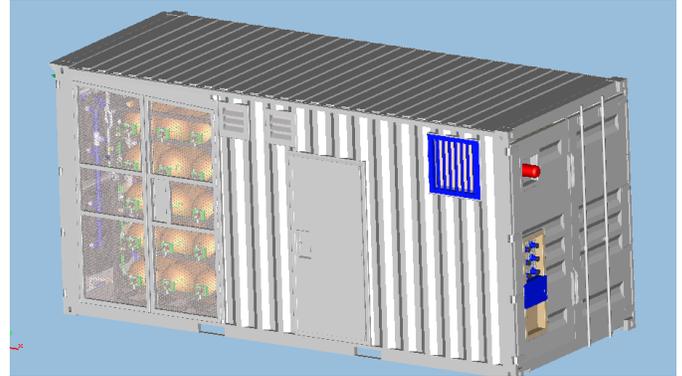
Maritime Hydrogen Fuel Cell

Hydrogen Fuel Cell Demonstration Project at Port of Honolulu

Hydrogen fuel cells have a long track record of supplying efficient, emissions-free power for a wide range of applications, including mobile lighting systems, forklifts, emergency backup systems, and vehicles. The Maritime Fuel Cell Project seeks to add another application to that portfolio, maritime power, by demonstrating a hydrogen fuel cell deployment in a commercial port setting.

The two year project culminates in late 2015 with a six-month demonstration and validation pilot hosted by Young Brothers, Ltd., at their facility in the Port of Honolulu. The pilot hydrogen fuel cell unit will be used in place of a diesel generator currently used to provide power for refrigerated containers on land and on transport barges.

Hydrogenics Corp. is designing and manufacturing a containerized 100-kilowatt hydrogen fuel cell package, which includes the fuel cell engine, a hydrogen storage system, and power conversion equipment built into a standard shipping container, with outward appearance and functionality similar to currently-used maritime diesel generators.



Artistic rendering of proposed maritime hydrogen fuel cell, designed by Hydrogenics Corp. Image courtesy of Hydrogenics Corp.

The pilot hydrogen fuel cell unit will be deployed in the Port of Honolulu by project partner, Young Brothers, Ltd., a subsidiary of Foss Maritime Company. As the primary inter-island shipper of goods within Hawaii, Young Brothers, Ltd. has a strong environmental and financial interest in the project. Initially the unit will be used on land and later will be deployed on-board barges traveling between the Port of Honolulu and Port of Kahului, in both cases providing power so refrigerated containers keep their perishable contents cold throughout the journey.

During the 6 month demonstration, performance feedback and data will be collected to determine the environmental, energy and cost savings from the unit. Sandia will analyze the operational, safety and cost performance data to develop a business case for using hydrogen fuel cells at other ports. Feedback from stakeholders on the design and operation may guide regulators toward formal codes and standards for hydrogen and fuel cells in maritime applications which will increase adoption of this clean energy technology.



Traditional maritime diesel generator deployed at Port of Honolulu by Young Brothers, Ltd. Photo courtesy of Young Brothers, Ltd.

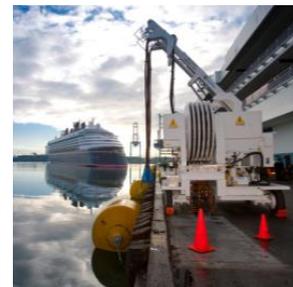
Project Partners

Sandia National Laboratories provides the overall project leadership and coordination services for the 12-partner team as well as lending its unique expertise in hydrogen materials, systems, and risk analysis, and codes and standards development. Sandia is also responsible for hydrogen supply and delivery coordination and will be providing independent technical and business-case analysis.

Other partners include the Department of Energy's (DOE's) Fuel Cell Technology Office (part of the Office of Energy Efficiency and Renewable Energy) and the Department of Transportation's Maritime Administration, which are sponsoring the project, as well as Hawaii Natural Energy Institute, which will assist with hydrogen supply issues, the Hawaii Center for Advanced Transportation Technologies, which is providing the hydrogen for the duration of the demonstration, and Pacific Northwest National Laboratory, which is conducting hydrogen safety training for personnel and first responders. Also involved are the Hydrogen Safety Panel, the U.S. Coast Guard and its local Sector Honolulu office, and the American Bureau of Shipping, all of which are independently reviewing the safety aspects of the design and operating plans and which see the project as a step toward formal regulations for hydrogen and fuel cells in maritime applications. Each partner has contributed significant time and/or equipment to the project at their own cost.

Environmental Impact Benefits

Major ports can produce daily emissions equal to those of half a million cars or more, many U.S. ports have begun to adopt green practices to combat these environmental impacts. Hydrogen fuel cells have the potential to meet the electrical demands of vessels in the port as well as supply power for other port uses, such as yard trucks, forklifts and other material handling specialty equipment. Hydrogen fuel cells produce zero pollutant emissions and no greenhouse gases at the point of use and can reduce the overall amount of diesel or other maritime fuel used.



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